Five days after the onset of substernal chest pain, a 60-year-old man with a history of hypertension, smoking (60 pack-years), severe bullous emphysema, and epilepsy presented with acutely worsening chest pain. Pharmacological management for non-ST-segment elevation myocardial infarction was initiated based on 12-lead ECG findings of subtle anterolateral ST segment changes (V2–V5) and a troponin I level of 6.36 ng/mL (normal <0.04 ng/mL).

Invasive angiography demonstrated a distal occlusion of a right posterolateral branch and a nonocclusive stenosis in the distal circumflex artery (Figure 1A and B). Cineangiography showed two small craters of contrast protruding outside the contrast-filled left ventricular contour within a dyskinetic basal inferior wall (Figure 1C and D and online-only Data Supplement Movie I). Because the occlusion was distal, percutaneous coronary intervention was not performed.

Figure 1. Invasive angiography showed an abrupt occlusion of a right posterolateral branch (A; white arrow) and diffuse nonocclusive stenoses in all 3 epicardial coronary arteries (A and B). Ventriculography in a right anterior oblique projection showed a dyskinetic basal inferior wall with 2 craters of contrast extending outside the contour of the contrast-filled left ventricular cavity (C and D; black arrows).
Transthoracic echocardiography showed heterogeneous echogenicity within a 28-mm-thick, dyskinetic, inferior left ventricular wall (online-only Data Supplement Movie II) and a mass protruding into the left atrium (Figure 2). This unusual mass was suspicious for an intramyocardial hematoma based on the clinical setting and its location within myocardium subtended by the occluded artery. Left ventricular ejection fraction was estimated visually to be 45%. There were wall motion abnormalities in the basal and midanterolateral, inferolateral, and inferior walls extending into the apical inferior wall. In retrospect, the anterolateral ST changes likely represented a combination of inferior and inferolateral infarct and ischemia. All antiplatelet and antithrombotic agents except for aspirin were discontinued, and the patient was transferred urgently for surgical evaluation and cardiovascular magnetic resonance imaging.

The regional wall motion abnormalities and visually estimated ejection fraction seen on real-time cine images were similar to those seen on the previous echocardiograph. Perfusion imaging during administration of gadolinium contrast agent (gadopentetate dimeglumine 0.15 mmol/kg) and early gadolinium enhancement images (3 minutes after administration of contrast) demonstrated a hypoperfused intramyocardial hematoma in the basal and midinferolateral, inferior, and inferolateral walls of the left ventricle and in the posterior and lateral left atrium (Figure 3 and online-only Data Supplement Movie III). Combining information from short-axis late gadolinium enhancement and bright-blood T2-weighted images demonstrated that the intramyocardial hematoma was constrained by visceral pericardium in the inferior wall (Figure 4). Thus, this portion of the intramyocardial hematoma met criteria for a left ventricular pseudoaneurysm. The intramyocardial hematoma dissected from the basal inferior/inferolateral wall through the plane of the mitral valve. The wall of the left atrium was identified posteriorly on long-axis, bright-blood, T2-weighted images, constraining the intramyocardial hematoma from rupture into the left atrium (Figure 4). The left atrial wall was distorted, partially compressing the left atrial cavity (online-only Data Supplement Movie IV). The portions of the intramyocardial hematoma constrained by the left atrial wall and within the left ventricular myocardium had similar characteristics on first-pass perfusion and early gadolinium enhancement images (Figure 3 and online-only Data Supplement Movie III). Pericardial enhancement and a small pericardial effusion were seen. The intramyocardial hematoma was surrounded by transmural myocardial enhancement (infarction) on late gadolinium enhancement images. Bright-blood T2-weighted images before administration of contrast demonstrated increased myocardial signal intensity in the infarcted region, which is

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characteristic of edema associated with acute myocardial injury.

Surgical consultation was obtained, but conservative management was recommended because of the extensive nature of the defect, the likely friable tissue, and the lack of reliable borders for surgical repair. Further imaging with contrast computed tomography and serial echocardiograms documented a slight increase in the size of the pericardial effusion over the subsequent 2 days. The patient died suddenly in the hospital 6 days after his initial presentation, presumably because of myocardial rupture.

Both dissecting intramyocardial hematoma and left atrial intramural hematoma are rare, but to our knowledge the combination of the 2 has been reported only 4 times. All previously reported cases were also in the setting of acute inferior myocardial infarction. Three of the 4 previously described patients died within days of symptom onset, whereas 1 survived past 1 year. The survivor was 1 of 2 patients managed surgically. Previous descriptions of this entity as a “pseudoaneurysm with subepicardial dissection,” an “incomplete left atrial rupture,” and a “complex cardiac rupture” have implied a pathophysiology between intramyocardial hemorrhage and rupture. Mechanistically, intramyocardial blood under left ventricular pressure presumably dissects within tissue planes of the left ventricle, then beneath the coronary sinus and within the wall of the left atrium.

A dissecting intramyocardial hematoma associated with an intramural left atrial hematoma is a rare mechanical complication of myocardial infarction. The prognosis of patients presenting with a dissecting intramyocardial hematoma with extension into the left atrial wall is poor, both with surgical and conservative management. In this case, echocardiography and cardiovascular magnetic resonance imaging aided in understanding how the impending rupture was constrained and guided surgical risk assessment.

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References
Multimodality Imaging of a Dissecting Intramyocardial Hematoma Extending into the Left Atrial Wall Following Myocardial Infarction
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